MARINE REVIEW.

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Freight Matters—New Ships—Ore Shipments.

A few days more will find vessels of the largest class rapidly joining the large number of craft that have already gone into winter quarters, and there is no general interest in the rates of freight being paid on the closing charters covering odd cargoes of grain and coal. The movement of iron ore has probably been cut down 200,000 or 300,000 tons by the cold snap that came on a couple of weeks sooner than was expected, and which has caused unusual delay and extraordinary efforts with steam pipes and other devices for thawing large quantities of ore that was caught in dock pockets. But on this score there is no general regret, as the result will be so much less ore on Lake Erie docks when navigation opens next spring.

Figures covering the entire output of ore up to this time, which is practically the full season, would be very interesting just now. The statistics are not yet at hand, but a table printed herewith will serve to show in round numbers the output of the leading mines for the season of 1894. To everybody in the ore business these figures will at least be interesting in advance of the official report, on account of the railway companies this year refusing to give out statements of shipments by mines. The figures were secured from Cleveland sales agents and include ore in transit as well as cargoes now being loaded.

Mines.	Gross tons.
Norrie and Pabst	805,000
Mountain Iron	575,000
Chandler	550,000
Oliver	506,000
Minnesota	500,000
Cleveland and Iron Cliffs	390,000
Minnesota Company's mines on Mesabi range	350,000
Pittsburg and Lake Angeline	350,000
Gogebic consolidated mines, Colby, Tilden, etc.	326,000
Lake Superior	325,500
Chapin	236,000
Pewabic	390,000
Franklin	223,000
Aurora	205,000
Penn Iron Mining Company	175,000
Commonwealth	140,000
Biwabik	60,000
	6,036,500

Of course this total does not represent the entire output of Lake Superior mines, which will be nearly 7,500,000 tons. The figures by mines are produced simply for the purpose of showing what the leading ones have been doing during the past season. Neither is the above total a fair indication of the present rate of production at the leading properties, as in some cases, notably the non-Bessemers, the shipments were largely from accummulated stock piles. But in all cases the figures set down in the table are, although appearing in round numbers—as in the case of the Minnesota with even 500,000 tons, for instance—within 1,000 to 3,000 tons of the actual output.

The total of Mesabi shipments will probably be surprising, even to the owners of mines on that range. Shipments of Mountain Iron, Oliver, Franklin, Biwabik and the Minnesota properties on the Mesabi foot up 1,712,000 tons, and to this there will be added probably 50,000 tons from the Hale and one or two smaller mines.

Notwithstanding the heavy output of ore, there is, as has already been noted, every prospect of lower lake docks containing less ore next spring than for three years past. The heavy manufacture of pig iron in the furnace districts supplied by Lake Superior ores continues unabated, and although there has been some accumulation of stocks within the past two weeks, the amount being piled in furnace yards is not great by any means. The situation is such that there is a probability of something of an advance being obtained in prices to be paid for next season's ore, and it seems quite certain that sales, as well as contracts for carrying the ore, will be made much earlier in the winter than has been the case for two or three years past. If there is any truth in the rumor of a break in the steel rail combination, which is prompted by Mr. Carnegie's utterances at a banquet in New York a few days ago, then there is an additional reason for expecting increased production of steel, as the lower prices that would result in the rail market should prompt purchases from railway companies, though they might be compelled to borrow money in order to take advantage of low prices.

Conditions just noted have all combined to cause some figuring among ore companies for a few new boats. The Minnesota company has asked for bids on a steel steamer in addition to the two steel schooners they are building at Chicago, and the Mutual Transportation Company of Cleveland, which is made up of stockholders who are interested also in the Globe Iron Works Company, has in view the construction of a steel steamer or two steel consorts, but nothing will be settled regarding them until the annual meeting is held a few weeks hence. Messrs. R. R. Rhodes, John W. Moore and others, whose interests are connected with the firm of Moore, Bartow & Gilchrist, Cleveland, are also considering the advisability of building a steel steamer. Thus the season is closing without much profit in any department of the lake business, but with better prospect of some building and more activity in the carrying trade next spring than could be noted a year ago.

A Great Boiler Works.

The Lake Erie Boiler Works of Buffalo, the largest marine boiler works in America, has been making some improvements in its shops that are indicative of the magnitude of the concern. A new erecting shop 150 by 65 feet is especially suited to work on the very heavy Scotch boilers that have of late been going into big ships, and the new machinery includes a flanging press capable of flanging plates up to 2 inches in thickness, with heating and annealing furnaces; two of Hammond's improved three spindle drilling machines for drilling the boiler shells and other parts, after the plates are formed in place; two of Hammond's improved universal joint radial drills; two fifty-ton hydraulic cranes, 40 feet lift; two ten-ton hydraulic jib cranes; one of Hammond's improved portable hydraulic riveters for pressing rivets up to 2 inches in diameter, at 250 tons pressure, and which may be handled by one man. Of course this machinery is only supplemental to other apparatus for riveting, flanging, drilling, topping, hoisting and conveying purposes, which the Buffalo company was among the first in this country to adopt.

In General.

The new French Navy estimates provide for the laying down of 65,000 tons of warships next year, in addition to the 291,000 tons now in progress. Amongst the new vessels are two 23-knot cruisers.

Another of the British torpedo boat destroyers built by J. I. Thornycroft & Co., of Chiswick, the Ardent, has made better than 29 knots on trial. Her speed on two runs, one with the tide and the other against, was 29.18 knots, against 29.25 knots for the Daring, the fastest of the large number of vessels of this type recently added to the British navy. Engines and boilers of the Ardent are similar to those of the Daring, described in the last issue of the REVIEW. The horse power developed on the trial was 5,000, the boiler power being 210 pounds to the square inch and the mean revolutions 407 per minute.

Captain Frederick Vehling, has arrived at Agana, on the Island of Guhan, in the Ladrones, having made the trip of 6,500 miles from San Francisco in a twelve ton schooner—46 feet long and 12 feet beam—accompanied by his wife and seven children. He left San Francisco last spring to engage in coffee-planting in the Southern Pacific, and a letter received from his wife tells the story of the remarkable voyage. Vehling's oldest child is only fourteen years old, but the two eldest children took turns in steering during the day and father and mother alternated at night. It took several weeks to reach Honoluln from San Francisco, and thirty-three days more to run from Honolulu to Agana, which is beyond Manila

A certain test of steam pipe coverings leads to the conclusion that it costs $15,40 to run 100 feet of naked two inch pipe at from 70 to 80 pounds pressure for one year of 3,000 working hours, with coal at $2 per ton. With the least efficient of insulating coverings used in the test this loss could be reduced to $4, with the most efficient to $2.64. Striking as are these figures, they are probably below the cost of actual practice, for a steam pipe is under pressure usually more than ten hours a day, and $2 a ton is below the averge cost of coal. In some tests made for the Manufacturers' Mutual Insurance Company, a short time ago, it was shown that with coal at $4 per ton and 3,000 working hours per year, the loss from a naked two inch pipe was 64½ cents per linear foot.—Power.

Subaqueous Rock Excavation on the Lakes.

It is probably not generaliy known that to Mr. C. F. Dunbar of the firm of Dunbar and Sullivan, Buffalo, N. Y., belongs the credit for having first successfully applied the system of sub-marine drilling and blasting that has attracted so much attention on the lakes, and throughout the world in fact, and which has resulted in a wonderful reduction in the cost of such work On his first contract at Port Colborne, Ont., in 1875, Mr. Dunbar was paid $9.90 per cubic yard, and on the second at Lime-Kiln crossing, Detroit river, he was paid $7 per cubic yard. Contracts have of late been made as low as $1.20.

But a short paper prepared some time ago by Gen. O. M. Poe, corps of engineers, U. S. A., who has for a long time past been in charge of the most extensive channel improvements on the lakes, will best serve to assert Mr. Dunbar's claims to credit for the process now used, and at the same time give considerable information about subaqueous blasting, although it was not intended as an essay upon that subject. At the engineering congress held in connection with the World's Columbian Exposition, Mr. James Deas, C. E., engineer Clyde navigation, presented a paper, in which he described the method adopted by Col. Beaumont for subaqueous rock excavation on the Clyde in 1880. In discussing this paper Gen. Poe refers briefly to its interesting features and then says:

"A large amount of that kind of work has been done under my direction during the last ten years, and I am an ardent advocate of subaqueous blasting and the use of dredges for removing the broken rock, in preference to the old method by means of a cofferdam. In August 1883 I was assigned to the charge of the work of improving Detroit river at the Lime-kiln crossing, and of the Hay Lake channel in St. Mary's river, Mich. I found subaqueous blasting in progress upon both works. At the former, the contractor, Mr. C. F. Dunbar, of Buffalo, N. Y. had in use an efficient plant of his own. At the latter the plant belonged to the United States, but it was much less efficient than Mr. Dunbar's, although the idea was borrowed from his. The history of the adoption of his method of subaqueous blasting by Mr. Dunbar may be briefly given.:

"In 1866 or 1867, Mr. Dunbar had undertaken the removal of rock at the harbor of Erie. He drilled and blasted a portion of the rock through the ice, in the winter time, and when there was no ice used a raft for the purpose. All the drilling was done by hand. The average depth of the excavation in the rock was about 6 feet. In the fall of 1872, Mr. Dunbar, as sub-contractor to Mr. Geo. Neilson of Belleville, Ont., a contractor under the Canadian government, undertook the excavation of subaqueous rock at the harbor of Port Colborne, Lake Erie. An attempt to drill the rock by hand failed, because the rock was found to be so hard that three men could only drill about one foot in a day, and the use of some more economical method was imperative. During the winter of 1872-3, Mr. Dunbar constructed a steam drilling machine, using the hull of an old dredge to carry the machinery. He fitted the scow with a vertical spud at each corner, to pin it up and hold it firmly in position, and laid a track on the edge of the deck along which to move the drills. On this track were mounted two 5-inch steam cylinder percussion drills, arranged to slide up and down in a vertical frame overhanging the side of the scow. The drills were raised or lowered by means of a windlass operated by hand, and were moved along the track by means of crow bars. The scow was 50 feet long, and by starting one drill at the end, and the other at the middle of the track, each drilling five holes at intervals of 5 feet, he was enabled to drill ten holes at one position of the scow. Holes 9 feet deep could be drilled without changing the drill bits for longer ones. As soon as a hole was drilled to the requisite depth it was charged and blasted without moving the scow. When one row of holes had thus been disposed of the scow was moved back from the face of the excavation a distance of 6 feet, and the operation was repeated. The depth of channel made was 14 feet, which required the removal of the rock to an average depth of 2 feet, the maximum depth being about 6 feet. The rock was a hard, black, flinty limestone, which could not be broken by charges of ordinary blasting powder, but yielded to more powerful explosives.

"The work proceeded successfully from June to October, 1873, when it was stopped. In 1875, the Canadian government re-let the work, but required a channel depth of 17 feet. The contract was awarded to Mr. Dunbar, who used the machine described above, and successfully completed the undertaking. The difficulties encountered were, first, the extreme hardness of the rock, (Mr. Dunbar considers it the hardest he has ever excavated) and second, exposure to heavy seas, which required the use of a machine that could be readily and quickly moved to a place of shelter. During the progress of work under this contract Mr. Dunbar devised his apparatus for charging the drill holes. It is equally ingenious and simple, consisting of a copper cylinder having a smaller diameter than the drill hole, and length sufficient to admit the entire cartridge. At its upper end it is attached to a piece of iron gas pipe long enough to extend well above the surface of the water. The copper cylinder is slotted on one side throughout its whole length, to permit the insertion of the cartridge with its exploding wires fastened to the upper end. When the cartridge, with its wires, has been passed into the cylinder, the latter is inserted in the drill hole, and a long pole is passed down through the gas pipe forming the extension of the cylinder. The whole pipe is then withdrawn, the pole being used to prevent the cartridge from coming with the cylinder. As soon as the charging apparatus has been entirely removed the cartridge is exploded.

"So far as I am informed this was the first steam drilling plant used in this manner for subaqueous work. It was afterwards greatly improved in some of its details, but the essential portions have not been changed. Among the most important improvements have been the introduction (while engaged upon the Lime-Kiln crossing work in 1879) of a hydraulic ram to move the drills, both vertically and horizontally, and the use of a steam pump to force water into the drill holes for the purpose of cleaning them of all debris. The latter device was first applied at Middle Neebish, Hay Lake channel, where the excavation was in a very coarse, hard sandstone rock. The continuous use of the water jet during the operations of drilling obviated the difficulty resulting from the packing of sand (drill cuttings), around the drill bit, which was often sufficient to render it impossible to withdraw the bit from the drill hole. It also left the finished hole entirely free from sand or other material which would otherwise prevent the cartridge from going to the bottom of the hole. Simple as this device is, it made the difference between complete success and partial failure of the method at this locality.

While Mr. Dunbar was employed upon the contract of 1875, Mr. W. G. Thompson was resident engineer of the Welland canal, including the harbor of Port Colborne, and M. C. James was the assistant engineer in charge. If these gentlemen are still living they will doubtless remember all the facts concerning the use of Mr. Dunbar's method for subaqueous blasting at Port Colborne harbor. Apparently Col. Beaumont's adoption of a like method upon the Clyde in 1880, was entirely independent of any knowledge of what had already been done on Lake Erie in 1873, and again in 1875, as well as at Lime Kiln crossing in 1879. If this be the fact, it must still be admitted that the credit of propriety in the use of the method is due to Mr. C. F. Dunbar.

It may not be amiss to mention the prices paid for subaqueous rock excavation in recent years in this locality. The last contract at Lime Kiln crossing was taken by Dunbar & Sullivan, of Buffalo, at $4.43 per cubic yard, measured in the bank. The material is a compact buff limestone. The excavation was made in a current averaging about three miles per hour, but frequently running with much greater velocity. The channel was narrow, (only 300 feet wide when the contract was signed) and used by a commerce averaging fully 100 vessels per day, many of large size, which greatly interfered with the progress of the work and constantly endangered the contractor's plant a fact which had its influence upon the price.

The last contract at Middle Neebish, Hay Lake channel, was taken by John Hickler & Son at $1.20 per cubic yard, measured in the bank, a condition being that the major portion of the material should be formed into a dike rising 4 feet above the surface of the water. John Hickler & Son employed Dunbar & Sullivan to do the work, and it is supposed, at a price sufficiently below that named in the contract to leave a margin of profit to the original contractors. Dunbar & Sullivan have of late been at work upon two contracts for deepening the prism of St. Marys Falls canal, one at $1.53 and the other at $1.47 per cubic yard, measured in situ. The material is Potsdam sandstone in strata of varying thickness. The depth of the channel is 25 feet, and the average depth of cutting something in excess of 8 feet. The canal is the highway for a commerce which in 1892 amounted to more than 11,214,000 tons in 233 days. The passing commerce seriously impedes the work, but not to greater extent than was anticipated. John Hickler was also engaged of late in excavating a channel twenty-one feet deep, at Sailor's Encampment, St. Marys river, through blue limestone containing a considerable portion of flint, the contract price being $2.43 per cubic yard, measured in situ, and the average depth of cutting being something more than 6 feet. Subaqueous drilling and blasting have been in progress during the past season.

"The prices quoted indicate the economy of the method under discussion. It should stated however, that a cofferdam at the Lime-Kiln crossing would not have been practicable without such an interference with navigation as to be inadmissable, and at St. Mary's Falls canal the use of a dam would have been confined to the season of closed navigation, say from Dec. 1 to April 15. Each winter's operations would have involved the construction of a new dam."

After reading the above remarks from Gen. Poe, Mr. Deas, the author of the paper referred to, said: "Colonel Poe's remarks are very interesting, and they are so full and explicit that they leave me nothing to say except that I was quite unaware until now, and I believe Colonel Beaumont was also ignorant of the fact at the time he undertook our work, that the mode of boring adopted by him at Elderslie rock had been previously in use anywhere else."

Gen. Poe's paper is published in the Transactions of the Society of Civil Engineers, Vol. XXX, pps. 478, *et seq.* Mr. Deas' paper was also published in proceedings of the same society for July, 1893.

United States Merchant Marine.

The number of steam vessels of 1,000 gross tons and over that amount on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. This is one point brought out in the latest annual report of Mr. E. T. Chamberlain, United States commissioner of navigation. From advance sheets of this report, there was published in THE REVIEW of Oct. 4, 1894, a table showing the number of steam vessels, sail vessels, etc., owned in different districts throughout the lakes, and also a statement of tonnage owned in the several lake customs districts. The full report, which is now at hand, contains a great deal more in the way of statistics that is interesting. A table bearing out the statement that leads this article follows:

STEAMERS OF 1,000 TONS AND OVER THAT AMOUNT—WHERE THEY ARE OWNED IN THE UNITED STATES.

Districts.	Number of boats.	Gross tons.
Northern lakes	359	634,467.84
Atlantic and gulf coasts	248	526,713.58
Pacific coast	51	92,272.93
Western rivers	17	23,655.99
Total	675	1,277,110.34

Another interesting summary, which follows, is that of vessels of all kinds built in the United States during the year ending June 30, 1894:

VESSELS BUILT IN THE UNITED STATES, YEAR ENDING JUNE 30, 1894.

DISTRICTS.	SAIL VESSELS.		STEAM VESSELS.		CANAL BOATS AND BARGES.		TOTAL.	
	Number.	Gross Tons.	Number.	Gross Tons.	Number.	Gross Tons.	Number.	Gross Tons.
Atlantic and gulf coasts.	421	30,658.92	141	37,818.87	30	6,230.24	592	74,708.03
Pacific coast	38	1,695.44	20	3,696.65	.....	.....	58	5,392.09
Northern lakes	18	5,473.05	71	34,899.07	17	1,612.49	106	41,984.61
Western rivers	.....	.....	61	7,305.48	21	1,805.14	82	9,110.62
Total	477	37,827.41	293	83,720.07	68	9,647.87	838	131,195.35

Referring especially to the lake trade in his report, the commissioner says: "The growth of the merchant marine of the great lakes is the feature of our maritime development, the total tonnage of lake ports having increased 500,000 tons during the ten years between 1884 and 1894. Iron and steel steam tonnage on the lake has increased from 27,000 tons in 1885 to 260,000 tons in 1894. The iron and steel steam tonnage of New York state has increased from 145,000 tons in 1884 to 325,000 tons in 1894. The total tonnage of the Pacific coast has increased 35 per cent. during the decade."

Referring to localities in which most of the tonnage of the country is owned, the report says: "States with the greatest tonnage of all descriptions are New York, 1,333,665 gross tons; Michigan, 436,317; Massachusetts, 366,881; Maine 327,653; Ohio, 327,589; California, 315,516; Pennsylvania, 302,615; Maryland, 145,128. The twelve customs districts with the largest tonnage of all descriptions are New York, 1,057,788 gross tons; San Francisco, 307,226; Cuyahoga (Cleveland, O.), 234,734; Philadelphia, 221,648; Boston, 214,916; Buffalo, N. Y., 177,992; Huron, Mich., 171,629; Detroit, Mich., 161,846; Bath, Me., 124,649; Baltimore 122,872; St. Louis, 122,746; Milwaukee, 93,767. Of a steam tonnage of 2,189,430 gross tons of all descriptions, 482,294 tons are documented at New York, 183,224 at Cuyahoga (Cleveland), 128,839 at Buffalo, 128,386 at San Francisco, and 120,817 at Detroit. Documented yachts number 1,054, of 39,216 gross tons."

Although, as noted above, tables published in the REVIEW of Oct. 12 gave full statistics regarding tonnage owned in all parts of the country, it will not be out of place here to print a summary prepared by the commissioner. "On June 30, 1894," he says, "the documented merchant marine of the United States comprised 23,586 vessels of 4,684,029 gross tons, distributed geographically as follows: Atlantic and gulf coast, 17,468 vessels, 2,712,944 gross tons; Pacific coast, 1,520 vessels, 456,359 gross tons; northern lakes, 3,341 vessels, 1,227,401 gross tons; western rivers, 1,257 vessels, 287,325 gross tons. Cod and mackerel fisheries employ 1,606 vessels of 71,573 tons, of which 32,493 tons are documented at Gloucester, Mass.

"Vessels built and documented in all parts of the country during the year numbered 838 of 131,195 gross tons, a decrease of 118 vessels and 80,000 gross tons compared with the year ended June 30, 1893. Incomplete construction (St. Louis and St. Paul) at Philadelphia has absorbed much labor and capital during the year which will not be noted officially in construction until the vessels are finished. Every ship building country shows a decrease in construction last year, that of Great Britain amounting to 25 per cent.

"Our vessels registered for foreign trade number 1,350 of 916,180 gross tons including seventy-one whalers, 16,482 tons, while those documented for domestic trade number 22,236 of 3,767,850 gross tons; 1,184 canal boats of 126,279 tons and 1,417 barges of 397,323 tons are documented. Included in the merchant fleet are 811 iron or steel steam vessels of 878,333 gross tons and 5,715 wooden steam vessels of 1,311,097 gross tons; twenty sailing vessels of 22,988 tons are of iron or steel.

"Since 1884 the number of our vessels has decreased 504, while the gross tonnage has increased 413,000 tons. The average size of vessels has increased from 177 tons in 1884 to 198 tons in 1894. Five ships and 123 steamers are over 2,500 tons each. In 1884 our steam tonnage, 5,401 vessels of 1,465,909 gross tons, was one-third of our merchant marine, while in 1894 it comprises 6,526 vessels of 2,189,430 gross tons, or nearly one-half of the total. Considering the greater efficiency of steam tonnage, the carrying power of our fleet, reckoned at 8,000,000 gross tons for 1884, may be put at 10,000,000 gross tons for 1894. In 1884 our iron and steel tonnage was less than 9 per cent. of the total; in 1894 it is 20 per cent. In 1884 the steel tonnage in our fleet was only 5,000 tons; in 1894 it is 350,000 tons. Steel marine construction in 1884 was carried on at only four points in the United States, while last year sixteen ports return such construction. During the decade wooden sailing vessels have decreased 230,000 tons in Maine, and 100,000 tons each in Massachusetts and New York, while California and Michigan show a gain of 50,000 tons each.

"Vessels registered for foreign trade number 1,350 of 916,180 gross tons, compared with 2,127 of 1,304,221 gross tons in 1884, the decrease in sailing vessels being 835 of 469,944 tons and the increase of steam vessels fifty-eight of 81,903 gross tons. Of the increase 40,000 tons is due to the admission of foreign built vessels, the New York and Paris constituting 21,000 tons of this amount. In the decade, in Maine which imposes the highest taxes on shipping noted in any state or country, tonnage registered for foreign trade has decreased two-thirds (223,000 tons); Massachusetts three-fifths (120,000 tons); Pennsylvania, over one-third (28,000); New York, one-seventh (60,000 tons). California's tonnage has increased about one-sixth (24,000) and Washington's more than doubled (36,000 tons).

"Iron and steel steamships registered for foreign trade number 108 of 228,575 gross tons, but of these only six last year crossed the Atlantic and seven the Pacific to Asia or Australia. Of the total, fifty-two of 155,602 gross tons are registered at New York, which imposes no taxes on shipping in foreign trade, and sixteen of 36,630 tons at San Francisco. Philadelphia registers for foreign trade eight iron steamships of 8,482 tons, Boston three of 2,026 tons, New Orleans sixteen of 36,630 tons, Tampa two of 3,385 tons, and Seattle and Tacoma four of 2,875 gross tons."

Sailing Directions for the Lakes.

The REVIEW has just received from the Hydrographic Office a copy of the first of six books entitled "Sailing Directions for the Great Lakes." The work covers Lake Superior, St. Mary's river and the Straits of Mackinac. It is the purpose of the Hydrographic Office to publish as soon as possible a complete set of sailing directions for the great lakes, and if this first book is a sample by which the whole work is to be judged, there is no doubt of the service giving to lake mariners a series of publications that will render valueless all books of the coast pilot kind that have up to this time found sale among masters and mates. Chief Hydrographer Sigsbee says that Lake Michigan, Part II. of the series, is now in press and will be followed as soon as possible by Lake Huron, Lake Erie, Lake Ontario, and the St. Lawrence river as far as Montreal, where the work will connect with other Hydrographic Office publications, thus giving complete sailing directions from Duluth to the Atlantic ocean. There will also be a supplement to Lake Huron covering Georgian bay and the Northern channel.

For young men working up to positions of mates and masters this series of publications will be invaluable. Captains will also find the books of great value for ready reference, as they will contain the latest information regarding depths of water in all channels, with hythographic charts of the principal harbors. The first book contains a large chart of Hay lake channel and smaller ones of Eagle Harbor and Grand Marais.

As the Hydrographic Office is compelled by law to make some charge for its publications, the first book will be sold at $1, a price that would not cover cost of printing and engraving if the book was gotten out by private enterprise. The REVIEW is an agent for the Hydrographic Office for the sale of its publications on the lakes. We will immediately secure a supply of the sailing directions and anyone wanting a copy may have it by calling or addressing MARINE REVIEW, 516 Perry-Payne building, Cleveland, O. The books are not sold at the branch hydrographic offices.

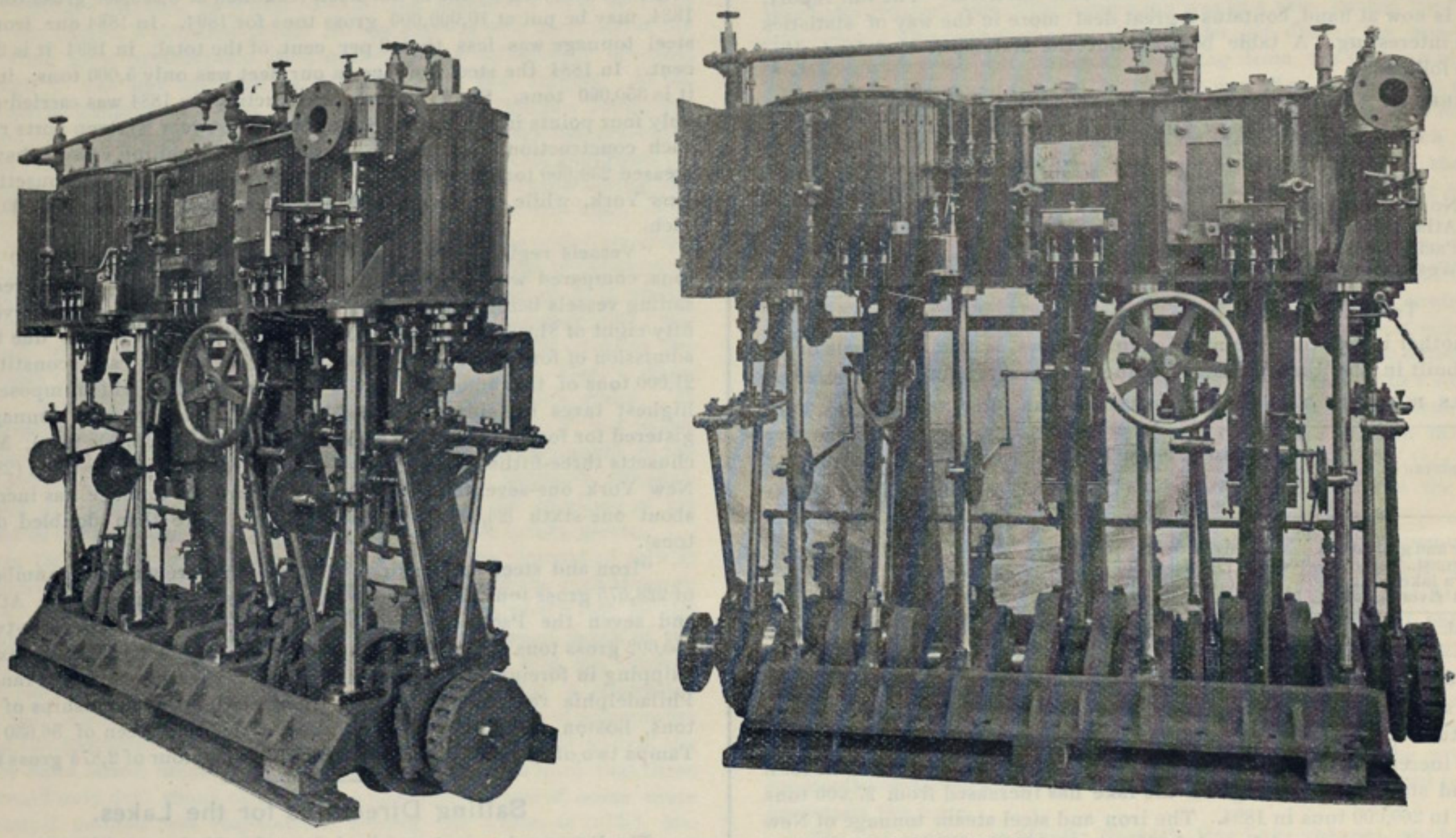
"SAILING DIRECTIONS FOR LAKE SUPERIOR, ST. MARY'S RIVER AND STRAITS OF MACKINAC" IS A PUBLICATION JUST ISSUED BY THE UNITED STATES HYDROGRAPHIC OFFICE. IT IS FAR IN ADVANCE OF PUBLICATIONS OF THE COAST PILOT KIND. PRICE $1. ADDRESS MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O. WE HAVE NO HESITANCY IN RECOMMENDING THIS BOOK.

Chief Shipping Master A. R. Rumsey of the Lake Carriers' Association, left Cleveland Monday on his trip around the world.

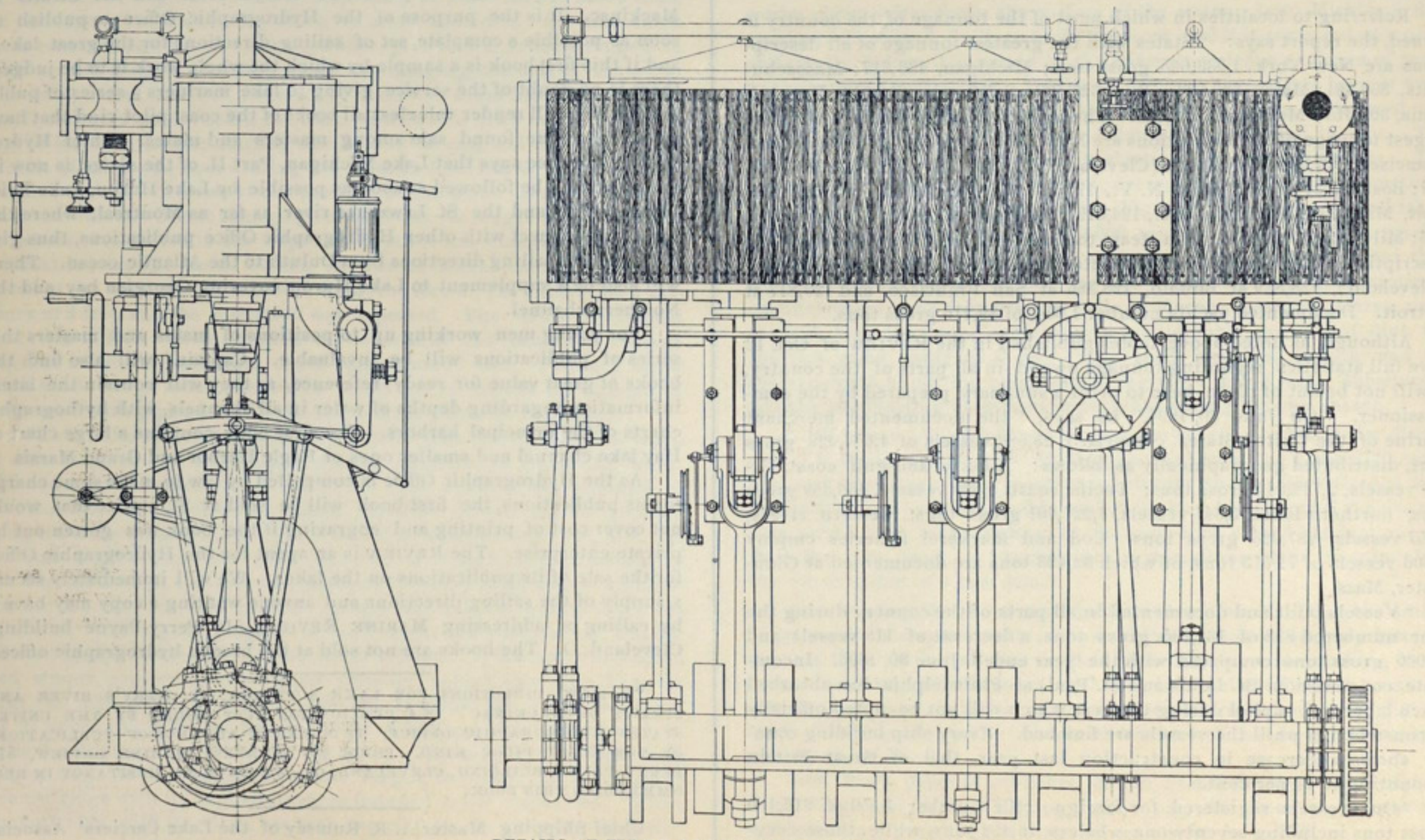
Yacht Engines, Triple Expansion Type.

Engines illustrated herewith were constructed by S. F. Hodge & Co., Detroit, for a yacht built by the Detroit Boat Works to the order of Edward Henkel of the same place. Details of the engine are so very clearly shown in the engravings that it is hardly necessary to do more than refer to the main dimensions. The diameters of cylinders are 9¼, 14½ and 24 inches and the stroke of piston is 14 inches. All pumps are independent. The air pump, which is of the Dean make, 4 by 6 by 5 inches, is connected to a keel condenser. These engines were designed for 300 horse power, maximum, at a speed of 300 revolutions and with a working pressure of 200 pounds. The diameter of propeller is 4 feet. Steam is furnished by a water tube boiler of ample size.

The yacht for which this machinery is built is of wood and is schooner-rigged with flush deck. Her dimensions are: Length, over all, 115 feet; length on water line, 102 feet; beam, moulded, 15 feet 6 inches; depth, moulded, 8 feet six inches; displacement, 50 tons. She has a large pilot and dining room on deck, and below deck forward are the crew's quarters and galley with smoking room and lavatory; aft is the owner's cabin, bath and toilet room, ladies' cabin and three state rooms. There are in all berths for thirteen people aboard the boat, and her equipment includes a fifty-light electric plant.



FRONT AND END VIEW OF TRIPLE EXPANSION YACHT ENGINES.



DETAILS OF TRIPLE EXPANSION YACHT ENGINES.

Test of the Steamer Madagascar.

Conducted by Henry Penton of the Frontier Iron Works.

The Madgascar is a wooden screw freight steamer, and is one of a pair, built in 1894 by Capt. Jas. Davidson at West Bay City, Mich., which are alike in all respects. She went into commission in August, 1894. The boilers and machinery were furnished by the Frontier Iron Works of Detroit, Mich., who sublet the boilers to Wickes Bros., of Saginaw, Mich. Some form of forced or assisted draft being required, that known as the "Howden system" was selected, and the apparatus therefor was furnished and fitted by the Dry Dock Engine Works of Detroit, Mich. Leading particulars of the hull and machinery are as follows:

Hull, length 257 feet over all
beam, 37 feet
depth, 14 feet
register tonnage, 1,202 tons
displacement, 3,287.2 tons at 14 feet 9 inches draft.

The engine is triple expansion, of the usual vertical inverted type, with cylinders 16, 25 and 42 inches diameter, and 34 inches stroke. The high pressure is placed in the middle, the intermediate forward and the low pressure aft. The high pressure and intermediate cylinders are fitted with single ported piston valves, the low pressure cylinder has a double ported slide valve. The high pressure valve is operated by Joy's valve gear, has a travel of 4 inches and is arranged for a maximum cut-off of 78 per cent. The other two are operated by link gear, have 4½ inches travel and a maximum cut-off of 72 per cent. There are no valve chests between the cylinders, and none of the cylinders are steam jacketed. The framing of the engine consists of four wrought iron struts or columns on the front or starboard side, and at the back of three cast iron columns forked at the lower end and carrying the crosshead slides. The cranks are three in number, set 120° apart, the sequence being H P. L. P., and I. P.

The air pump, bilge and cold water pumps are worked by a beam, from the intermediate pressure cross-head. The feed pump is independent, of Dean Brothers make, and takes its suction from hot well of air pump. The ratios of cylinders are as 1, 2.447, 6.89. Other dimensions are:

Shaft	9½ inches diameter
Crank pins	9½ " " 9½ inches long
Main journals	9½ " " 15 " "
Piston rods	3½ " "
Connecting rods	7 feet 6 inches long, ratio 2.64
Air pump	20 inches diameter, 12 inches stroke
Feed pump, duplex	6 inches by 4 inches by 6 inches
Propeller	11 feet diameter, 13 feet pitch
Main boiler	12 feet 3 inches diameter, 12 feet long
Furnaces, two	42 inches diameter, with separate combustion chambers
Number of tubes	314
Tubes diameter	2½ inches
Grate surface	42 square feet
Heating surface	1893 " "
Ratio heating to grate surface	45 to 1

The fan for supplying air to the furnaces is located in engine room and is driven by a vertical non-condensing engine 6 inches by 6 inches. Other auxiliaries, for which steam was used during these tests, were a duplex service pump 6 inches by 4 inches by 6 inches and a steering engine forward.

It being considered desirable to learn something of the steamer's performance, she was stopped at Detroit on her way down on Oct. 26, 1894, and the necessary apparatus placed on board. It is regretted that time could not be spared to make the tests more complete, but various reasons connected with the handling of cargoes caused so much delay in Lake Erie ports that the trials had to be cut short. Consequently only the leading features are summarized, but it is believed that while incomplete, they are fairly accurate. On the first trial the steamer was alone between Cleveland and Ashtabula, and on the second trial she towed a loaded consort. The cargoes, on Soo canal draft, consisted of 1,913 gross tons of ore for the steamer and 1,700 gross tons for the consort; total 3,613 gross or 4,046.5 net tons. There was no log on board and accurate tests of speed could not be made, but from time taken while passing certain points the average is placed at 11.25 miles per hour for the first test, the steamer being without consort, and 9 miles for the second, when she was towing the consort. It is believed that these are actually within the mark.

Both tests were made under ordinary working conditions. The engines were designed to be worked ordinarily with a high pressure cut-off of from 65 to 75 per cent. While cards No. 3 show a remarkably equal distribution of work, test No. 2 (Cards No. 8) seem to show the greater economy of working triple engines at later cut-offs.

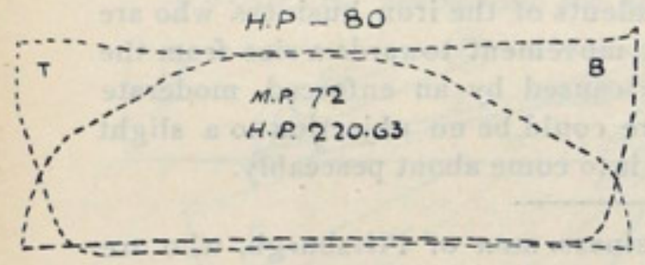
An interesting feature is a comparison of the cost of moving the steamer's cargo alone at a speed of 11¼ miles per hour with that of moving the combined cargoes at 9 miles per hour, and shows plainly what speed costs. The cost of coal is taken at $2.25 per ton.

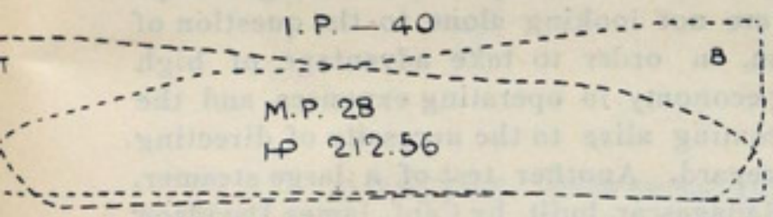
The first test was commenced after cleaning fires and continued for three hours. The second commenced after cleaning fires and continued

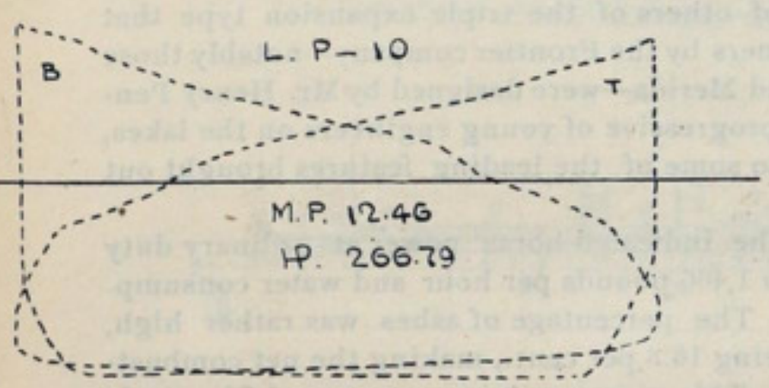
[CONTINUED ON PAGE 12.]

CARDS No. 3.

STEAM 150. VACUUM 22½ IN.
I. P. REC. 45. REV. 90.
L. P. REC. 6. H. P. VALVE TRAVEL, 2⅞ IN.

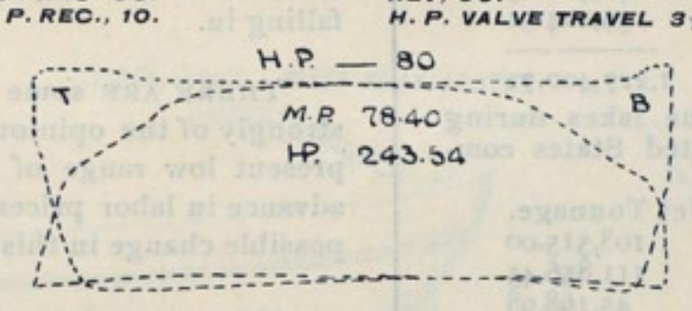


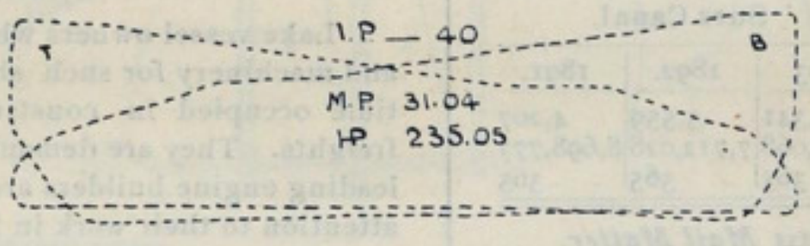


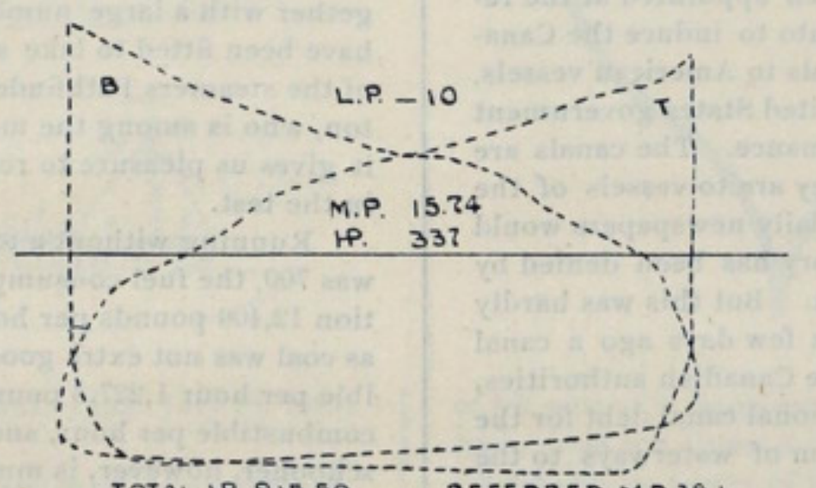


CARDS No. 8.

STEAM 155. VACUUM 23 IN.
I. P. REC. 55. REV, 90.
L. P. REC., 10. H. P. VALVE TRAVEL 3 3/16 IN.

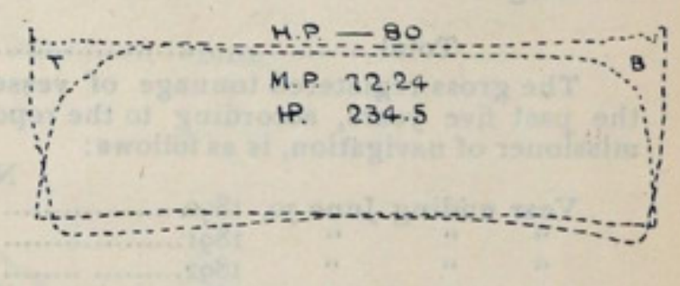


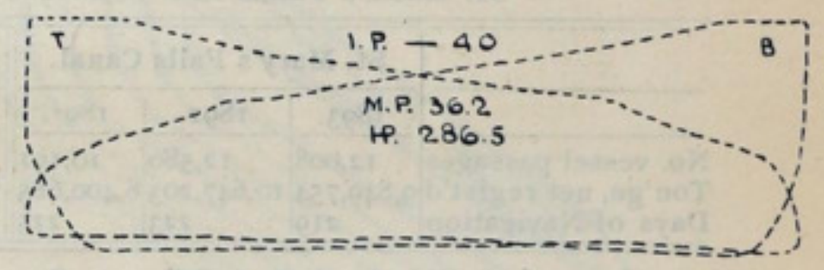


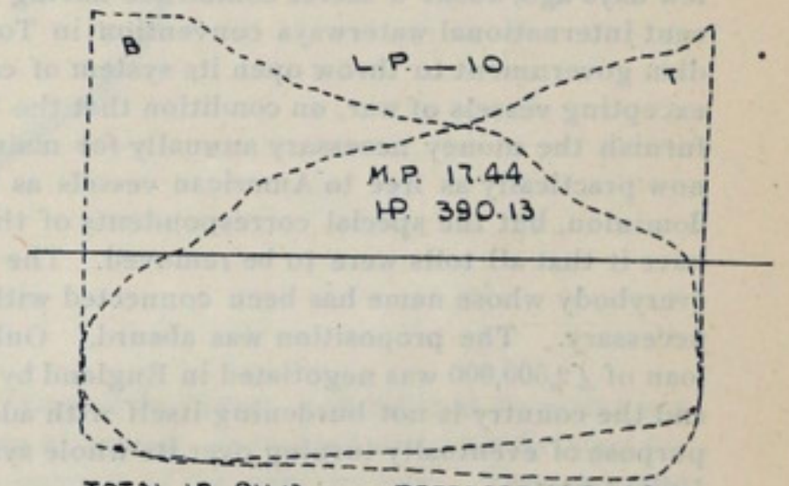


CARDS No. 12.

STEAM 155. VACUUM 24 IN.
I. P. REC. 65. REV., 94.
L. P. REC. 12. H. P. VALVE TRAVEL 4 IN.







MARINE REVIEW

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons and over that amount on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1894, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels	1,731	843,239.65
Sailing vessels	1,139	302,985.31
Canal boats	386	41,961.25
Barges	85	39,214.51
Total	3,341	1,227,400.72

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
Year ending June 30, 1890	218	108,515.00
" " " 1891	204	111,856.45
" " " 1892	169	45,168.98
" " " 1893	175	99,271.24
" " " 1894	106	41,984.61
Total	872	406,976.28

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1893.	1892.	1891.	1893.	1892.	1891.
No. vessel passages	12,008	12,580	10,191	3,341	3,559	4,207
Ton'ge, net regist'd	9,849,754	10,647,203	8,400,685	7,659,068	7,712,028	8,698,777
Days of Navigation	219	223	225	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

OF course there was no truth in the story sent out from Duluth, a few days ago, about a secret committee having been appointed at the recent international waterways convention in Toronto to induce the Canadian government to throw open its system of canals to American vessels, excepting vessels of war, on condition that the United States government furnish the money necessary annually for maintenance. The canals are now practically as free to American vessels as they are to vessels of the dominion, but the special correspondents of the daily newspapers would have it that all tolls were to be removed. The story has been denied by everybody whose name has been connected with it. But this was hardly necessary. The proposition was absurd. Only a few days ago a canal loan of £2,500,000 was negotiated in England by the Canadian authorities, and the country is not burdening itself with additional canal debt for the purpose of eventually turning over its whole system of waterways to the United States.

IN ALL the comment that has attended Commodore Meade's famous denunciation of cruisers, especially the Columbia and Minneapolis, at the recent meeting of naval architects and marine engineers in New York, we have seen no reference to the fact that there are few Lucanias or Teutonics to be chased by the Minneapolis or Columbia, while there are hundreds of merchant vessels of 15 to 19 knots speed that might be run down by the commerce destroyers. Lloyds latest publication shows that out of 13,000 steamers recorded from all parts of the world in the great classification registry, only 18 are credited with a speed of 20 knots or over, and of these nine are paddle steamers that are confined to channel service. Evidently there are some merchant ships that the Minneapolis or Columbia might overtake in a race and without steaming so as to consume the fuel supplies that are less than those of the express steamers.

OFFICERS of the hydrographic service are urging the establishment of additional branch offices on the lakes, at Detroit, Buffalo, Duluth, Sault Ste. Marie and Oswego. The feeling among vessel owners has been against any increase in the number of government officers on the lakes, that would demand additional appropriations from congress to the detriment of river and harbor improvements, new aids to navigation, etc., but if the naval officers engaged in hydrographic work continue along the line of such practical assistance to shipping as that noted in the new sailing directions for the lakes, they may overcome this feeling.

MAYOR LEWIS of Duluth has interested the light-house board in trying the experiment of placing a conical-shaped reflector of steel or iron behind the fog signal at that port, with a view to sending the sound lakeward, and thus overcoming complaint from citizens of the town who profess to be annoyed by the sound. If the plan proves practicable, the Mayor of Duluth will have solved a problem that has been of no little annoyance to the light-house service.

AS HAD been expected, Secretary Herbert of the navy recommends in his annual report to congress the construction of three battle ships of about 10,000 tons each, to cost exclusive of armament about $4,000,000 each, and twelve torpedo boats, to cost about $170,000 each. It would seem that an effort should be made on the lakes to secure some of this torpedo boat work. The secretary's declaration adverse to a continuance of the premium system was hardly expected.

SOME poor work from an engineering standpoint is plainly evident in the walls of the Canadian canal at Sault Ste. Marie, Ont., but the damage on this account to the canal and lock as a whole is not by any means sufficient to warrant the publication of a sensational dispatch like that which appeared in the New York World of recent date. The canal will be open for business next season, and there need be no fear of the walls falling in.

THERE ARE some very close students of the iron business who are strongly of the opinion that the first movement towards a rise from the present low range of prices will be caused by an enforced moderate advance in labor prices. Surely there could be no objection to a slight possible change in this direction if it is to come about peaceably.

MISGUIDED but enthusiastic business men of Pittsburgh, who are having another attack of ship-canal fever, have actually gone so far as to collect subscriptions to a guarantee fund in support of the Lake Erie—Ohio river ship-canal scheme.

Economical Engines.

Lake vessel owners who place orders nowadays for new freight ships and machinery for such ships are not looking alone to the question of time occupied in construction, in order to take advantage of high freights. They are demanding economy in operating expenses, and the leading engine builders are becoming alive to the necessity of directing attention to their work in this regard. Another test of a large steamer, this time a wooden boat, the Madagascar, built by Capt. James Davidson of West Bay City and engined by the Frontier Iron Works of Detroit, Mich., is reported in this issue of the REVIEW. As these engines, together with a large number of others of the triple expansion type that have been fitted to lake steamers by the Frontier company—notably those of the steamers Pathfinder and Merida—were designed by Mr. Henry Penton, who is among the most progressive of young engineers on the lakes, it gives us pleasure to refer to some of the leading features brought out in the test.

Running without a tow, the indicated horse power at ordinary duty was 700, the fuel cousumption 1,466 pounds per hour and water consumption 12,400 pounds per hour. The percentage of ashes was rather high, as coal was not extra good, being 16.3 per cent., making the net combustible per hour 1,227.3 pounds. This gives one horse power on 1.75 pounds combustible per hour, and 17.7 pounds water. The work done towing a schooner, however, is much better, the indicated horse power being 815.5 at 90 revolutions; the coal per hour 1,492 pounds; ashes 15.6 per cent.; net combustible per hour 1,259.6 pounds; water per hour 12,966.6 pounds; giving one horse power on 1.54 pounds combustible per hour, and 15.9 pounds water. This is a result, the builders claim, never obtained before on the lakes, and seldom elsewhere, with engines of such comparatively small power. The engines develop as a maximum 911.13 horse power. Boiled down this gives a ton of cargo carried one mile, without tow, on .97 of an ounce of coal, and towing, on .63 of an ounce. Or alone, a ton of cargo is carried 146.6 miles for one cent's worth of coal, and towing, 225.7 miles for the same cost. In the first case the speed is 11¼ miles per hour and in the second 9 miles.

The aim of the directors of the Cleveland and Buffalo Transit Company in voting to construct a new passenger boat is probably for the purpose of securing an expression from stockholders. It is more than probable now, however, that a boat will be contracted for by this company and that she will cost $300,000 or more, but even the matter of determining between a screw or a side-wheel ship has not as yet been settled.

Neither the Cramps nor the Bethlehem Iron Company have made answer to inquiries regarding the report that an order had been placed here by the Russian government for three armored cruisers, the Philadelphia builders to construct the ships and the Bethlehem company to furnish the armor.

Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

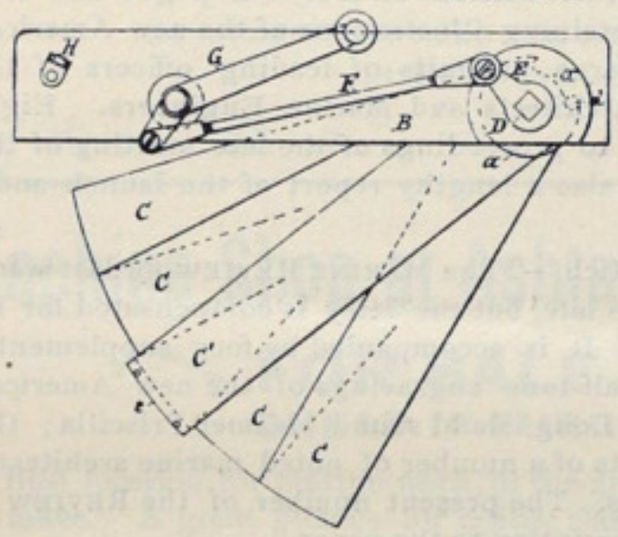
528,916. **Centerboard for Boats.** William R. Baker, Watertown, N. Y. Filed Mar. 7, 1894. Serial No. 502,627.

Claim. The combination with the well or casing provided with a shaft extending therethrough near one end, and the centerboard leaves mounted on said shaft, of a disk on each side of the leaves and fixed to and turning with the shaft, a pin extending through and between the disks, a stationary pin extending through the casing, a recess in each plate, a pair of recesses of different lengths in the edge of each of the leaves for the said pins to move in, the outside leaves joined together around the free ends of the central leaves and adapted when the board is open to lie in a central position, and means to operate the board.

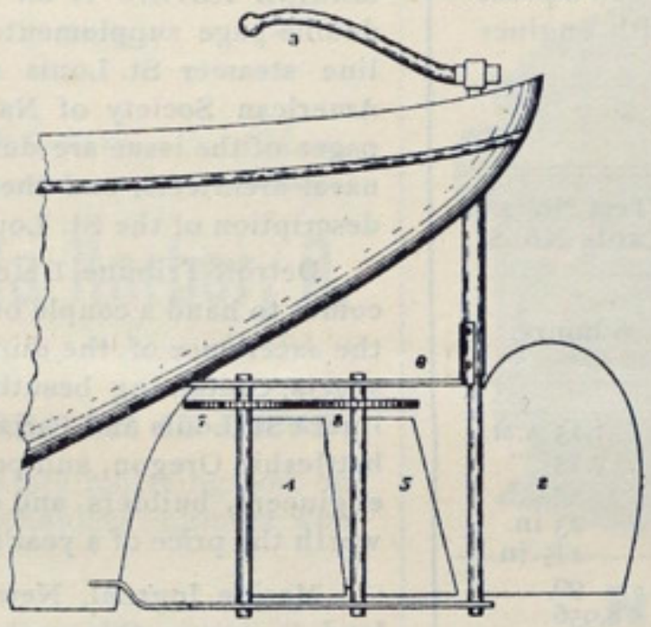
528,967. **Steering Apparatus.** Robert S. Peabody, Philadelphia, Pa. Filed May 14, 1894. Serial No. 511,130.

Claim. The combination in a vessel of a governing rudder and means for turning and holding it to direct the course of the vessel or ship, and directing rudders located abaft the vessel and geared together and free to turn in opposite directions.

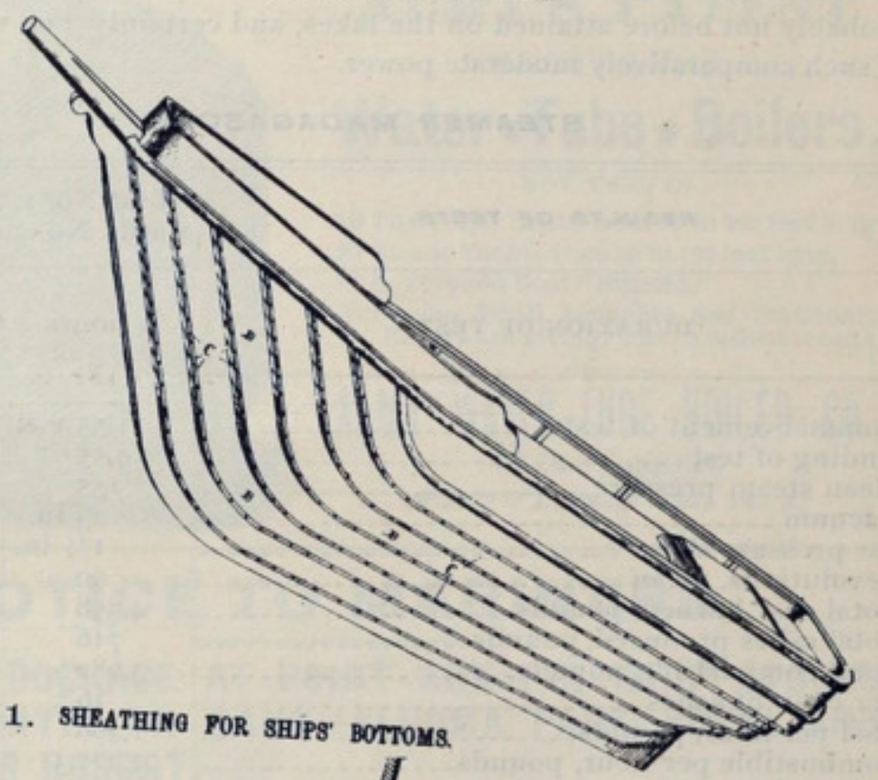
528,916. CENTERBOARD FOR BOATS.



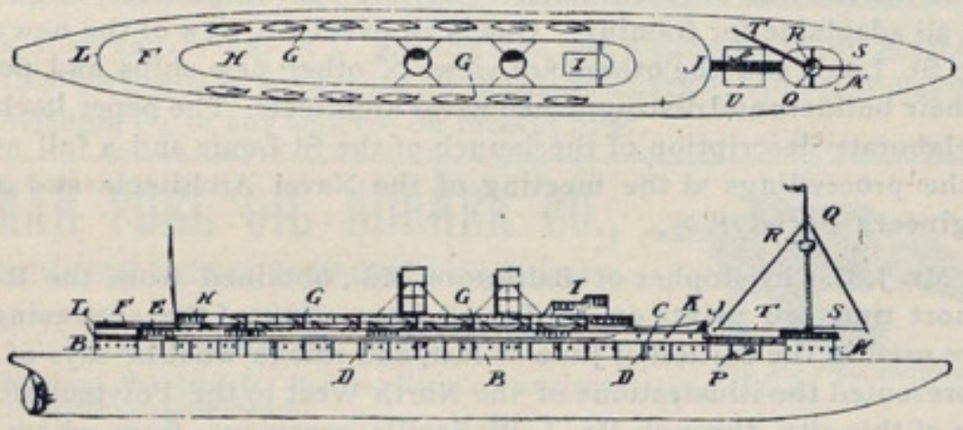
528,967. STEERING APPARATUS.



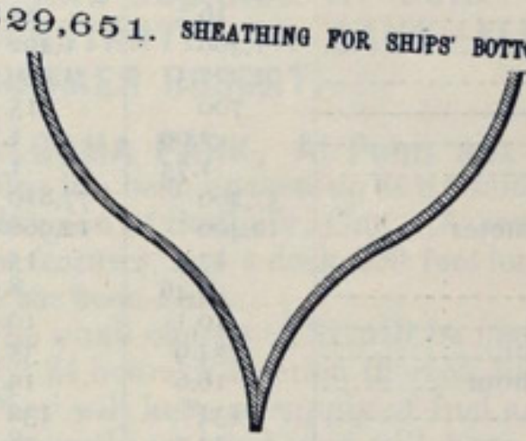
529,065. VESSEL.



529,295. STEAM FREIGHT AND PASSENGER VESSEL.



529,651. SHEATHING FOR SHIPS' BOTTOMS.



529,065. **Vessel.** William E. Dodge, Baltimore, Md. Filed July 18, 1894. Serial No. 517,926.

Claim. An improved vessel consisting of a series of vertical longitudinal timbers each arranged above and outside of the preceeding one, and horizontal planking C extending in a direction transverse the vessel and having their opposite ends secured to the opposite edges of the said vertical timbers.

529,295. **Steam Freight and Passenger Vessel.** Alexander McDougall, Duluth, Minn , assignor to the American Steel Barge Company, New York, N. Y., and West Superior, Wis. Filed May 29, 1893. Serial No. 475,925.

Claim. An improved freight and passenger vessel, provided with a hull, having a curved top or deck; cabins supported above said hull on turrets, a separate isolated turret, mounted upon said curved top or deck, in front of said cabins so as to break, divide and deflect to both sides any waves which may come over the bow of the vessel; a bulwark mounted in front of said cabins for breaking, dividing and deflecting the combings or crests of any waves which may break over said separate turret; a platform or walk, connecting said separate isolated turret with said cabins, a mast extending up from said separate turret, carrying a crow's nest for the look-out; a derrick arm, swinging from said mast, over said platform; and a hatch or hatches in said curved top or deck of the hull, beneath said platform.

529,651. **Sheathing for Ships' Bottoms.** Philip Inch, Washington, D. C., assignor of eight-fifteenths to B. N. Baker, Baltimore, Md. Original application filed June 20, 1894, Serial No. 515,142. Divided and this application filed Oct. 19, 1894. Serial No. 526,387.

Claim. In combination with the bottom of a ship or other craft, a covering consisting of a composite metal composed of tin and zinc prepared with sal ammoniac, and aluminum added thereto.

Trade Notes.

The Penberthy Bulletin, which has been published monthly for the last year and a half by the Penberthy Injector Company, Detroit, Mich., will be discontinued after the present issue and the Boiler Room, a new publication double the size of the Bulletin, will be issued in its place.

A pamphlet from the Phœnix Iron Works Company, Wason street, Cleveland, contains letters from the Globe Iron Works Company and S F. Hodge & Co. that are highly commendatory of cranes made for those companies. The cranes are specially suited to machine shop, foundry and ship yard use. John J. Shipherd of Cleveland is now president of the Phœnix company and L. C. Shipherd is secretary and treasurer. The company's works was recently enlarged and fitted with new mahinery.

The Gas Engine and Power Company, of Morris Heights on the Harlem, is equipped to build any kind of a pleasure boat, and the variety of its output is wonderful. One of the latest craft built at its works is a house boat for Chas. A. Dean of Boston, and which will shortly start for Florida under power of two engines of the naphtha type. The boat is 44 feet long, and has a draft of only 2 feet, but the accommodations are sufficient for four people besides a crew of three.

Around the Lakes.

Employes of the Vessel Owners' Towing Company, Cleveland, presented Manager Collier with a diamond stud, Tuesday.

The Connable Fishing Company of Petoskey, Mich., will build a fishing tug about 90 feet long at once. They want to sell a 72-foot tug they have, because it is too small to carry their new net lifter. Henry Corgan, Eagle Harbor, Mich., wants to buy a tug for spot cash, with engines from 12 to 14 inches square.

Abram Smith & Son of Algonac, Mich., are building a wooden steamer that will be offered for sale. She is to be entirely of white oak, 200 feet keel, 36 feet beam and 12½ feet moulded depth, and will class A 1*. Dredging is finished in the slip at this yard, which is intended for accommodating boats that are in need of repairs; it is 1,000 feet long, 50 feet wide and 12 feet deep.

A new single-deck wooden steamer being built by the Jenks Ship Building Company of Port Huron will be ready to launch before the new year. She is a 220 feet long, 35 feet beam and 14½ feet moulded depth. The motive power will be a fore and aft compound engine, having cylinders 22 and 44 inches, with a stroke of 30 inches. The boiler will be one of the fire-box type, 10½ by 12 feet. The boat is for sale.

[CONTINUED FROM PAGE 9.]

six hours, the fires being cleaned again before ending test. Several sets of cards were taken during tests, and those shown, No. 3 and No. 8, are identical with the others.

In all cases the intermediate and low pressure valves were worked in full gear. Cards No. 12 are simply an exhibit of maximum duty, with all three engines in full gear.

No account was taken of the steam used by auxiliaries, and on test No. 1 the service pump was in constant use. It will be noted also that on this test, with engines developing 700 horse power, the air pressure had to be maintained at as high a point as with engines developing 815 horse power, on account of the foul condition of tubes and furnaces. All auxiliaries excepting the feed pump exhaust into the atmosphere, the feed pump exhausting into the condenser.

Possibly the efficiency of the plant might be improved by having the fan engine exhaust into the low pressure receiver. The coal used was rather inferior and clogged the grates very badly; so much so that on the second test, while the air pressure at starting was 1¼ inches, it had risen to 1¾ inches at the end. The Dry Dock Engine Works kindly furnished every possible assistance in making these trials, and while we trust the information obtained may be found worth consideration, we regret, on their account as well as our own, that it is not more complete. Enough is here shown, however, to prove that the engines of the Madagascar and her sister ship the Nicaragua have, in developing one horse power on 1.54 pounds of combustible and 15.9 pounds of water per hour, reached a point probably not before attained on the lakes, and certainly not with engines of such comparatively moderate power.

STEAMER MADAGASCAR.

RESULTS OF TESTS.	Test No. 1. Cards No. 3.	Test No. 2. Cards No. 8.
DURATION OF TEST.	3 hours.	6 hours.
Commencement of test	1.55 P.M.	1.15 A.M.
Ending of test	4.55 "	7.15 "
Mean steam pressure	155	155
Vacuum	23 in.	23 in.
Air pressure at fan	1½ in.	1½ in.
Revolutions, mean	90	90
Total coal burned, pounds	4,398	8,956
Total ashes produced, pounds	716	1,407
Total combustible, pounds	3,682	7,549
Per cent. of ashes	16.3	15.6
Coal per hour, pounds	1,466	1,492
Combustible per hour, pounds	1,227.3	1,259.66
Indicated horse power	700	815.59
Coal per I. H. P. per hour	2.09	1.82
Combustible per I. H. P. per hour	1.75	1.54
Total water to boilers	37,200	77,810
Water per hour (per meter)	12,400	12,966.6
Water per I. H. P. per hour	17.7	15.9
Water per pound coal	8.46	8.68
Water per pound combustible	10.1	10.3
Coal per square foot grate per hour	34.9	35.5
I. H. P. per square foot grate per hour	16.6	19.4
Temperature feed water	131°	132°
Referred mean effective pressure	32.7	38.1
Total weight of machinery, pounds	----------	101,779
Weight per I. H. P., pounds	----------	111.7
Total weight of boiler and fittings, including water and Howden draft apparatus, pounds	----------	124,500
Weight per I. H. P., pounds	----------	152.7
Weight per I. H. P. of whole plant, pounds	----------	277.4
Speed per hour, miles	11.25	9
Ton, miles	24,106	36,420.5
Coal per ton, mile, oz	.97	.63
Miles per ton cargo for 1c. fuel	146.6	225.7

Compliments from all Quarters

With a view to giving to subscribers and the shipping interests in general a paper that would be worthy of preservation for reference, and for the purpose also of furnishing subscribers at the earliest possible date with a reliable and complete account of the launch of the American Line steamer St. Louis and the meeting in New York of the Society of Naval Architects and Marine Engineers, the last issue of the REVIEW was made a double number, containing with engravings forty-six pages of matter that was devoted largely to the subjects named. A representative of the REVIEW attended the launch of the St. Louis and the New York meeting, in order to secure information from first hands. No fuss was made over the publication of this issue, but we will probably be pardoned in giving up some space now to compliments since received from advertisers and other patrons who were impressed with the value of the paper:

Charles W. Whitney, New York, agent for Purves' boiler furnace flues, Serves boiler tubes and Ellis & Eaves induced draft—"I beg to congratulate you on your issue of Nov. 15 and 22. The get up of the whole paper does you credit, and I trust and believe will result to your profit."

Electro-Dynamic Company, Philadelphia, Pa.: "St. Louis edition of your paper was highly satisfactory to us."

M. H. Morley, Sodus Point, N. Y.—"Since writing you about delay in receiving the last issue of the REVIEW, the paper has come to hand with illustrated supplements, which are fine. Accept my thanks."

Richard P. Joy, Detroit, Mich.: "Enclosed find $1 for extra copies of your last number. You show much enterprise in publishing the double number with the fine illustrations, and you deserve much credit. 'Only the brave deserve a large circulation.'"

James C. Summers, editor Burgee and Penant, naval militia and yachtman's journal, New York: "Your handsome double number is certainly a very fine piece of work, especially the supplements, and I shall take pleasure in saying so in the next number of our paper."

H. E. Schmuck, Springfield, Mass.: "I am in receipt of the elegant double number with supplements, etc., which is ahead of anything I have seen with the exception of the one you published last June describing the North West. As far as I am concerned personally, the lake part of the REVIEW is much greater interest to me, but an effort of this kind should have the united support and praise of every subscriber of the paper."

Cleveland Plain Dealer, Cleveland, O.—"The current issue of the MARINE REVIEW is an elaborate edition of forty-six pages and four double-page supplements, containing illustrations of the new American line steamer St. Louis and large protraits of leading officers of the American Society of Naval Architects and Marine Engineers. Eight pages of the issue are devoted to proceedings of the late meeting of the naval architects, and there is also a lengthy report of the launch and a description of the St. Louis."

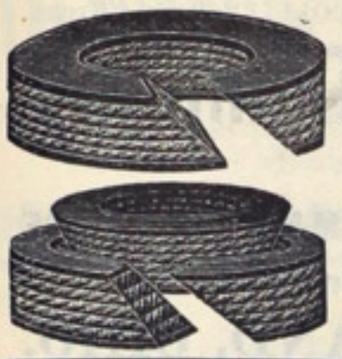
Detroit Tribune, Detroit, Mich.—"The MARINE REVIEW for last week comes to hand a couple of days late, but the delay is compensated for by the excellence of the number. It is accompanied by four supplemental sheets, containing beautiful half-tone engravings of the new American liners St. Louis and Paris; the Long island sound steamer Priscilla; the battleship Oregon, and portraits of a number of noted marine architects, engineers, builders and others. The present number of the REVIEW is worth the price of a year's subscription to the paper."

Marine Journal, New York N. Y.— "The MARINE REVIEW, Cleveland, O, comes this week with a double number, covering two ordinary issues and accompanied by the finest pictorial supplements we have seen in the marine line of recent date. They are four in number, large sheets and all adaptable for framing. One is an excellent view of the new steamship St. Louis and the others are views of other new ships and portraits of their builders and distinguished naval architects. The paper itself gives an elaborate description of the launch of the St Louis and a full account of the proceedings at the meeting of the Naval Architects and Marine Engineers' Society."

Mr. J. C. Christopher of Baltimore, Md., obtained from the REVIEW a short time ago prints on cardboard from some of the engravings that were used in the edition of June 30 last, and this is what he says of them: "I presented the illustrations of the North West to the Polytechnic Institute of this city, through Mr. J. W. Saville, president, from whom I have a grateful letter of acceptance and thanks. In very cordially transmitting his and my thanks, I deem it proper to say that the engravings nicely framed and hung prominently in the school will surely stimulate the embryo American mechanics to a higher level of thought and work."

Capt. Howard Patterson, principal of the New York Nautical School and author of Patterson's Nautical Dictionary, the Navigator's Pocket Book and other works of a marine kind, tells in a recent letter of the far-reaching influence of a single copy of the REVIEW mailed to him in New York. "I not only enjoy reading the REVIEW" he says "but every month I send the paper alternately to friends in South America and Egypt—to Captain Gabriel Laksey of the Red D Line steamship Merida in Venezuela, and to Captain George J. Carew, Suez Canal pilot, Port Thewfick, Suez, Egypt. These two commanders enjoy the paper very much, and after they are through with it they pass the same around to their friends, so you see that the REVIEW is read all along the North coast of South America and throughout the lenth of the Suez canal and Red sea, and is carried to China and Japan."

In some of the vessels of the United States navy boilers have at times been used as trimming tanks. In his annual message, Engineer-in-Chief Melville recommends that stringent orders be given to prevent this practice, particularly when salt water is run into boilers having steel tubes. The cost of retubing the boiler, he says, is the least of the resulting evils. A much more serious trouble is that if the practice is allowed to continue, the boilers of a vessel are liable to give out at any time and without warning.



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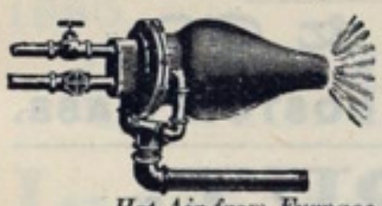

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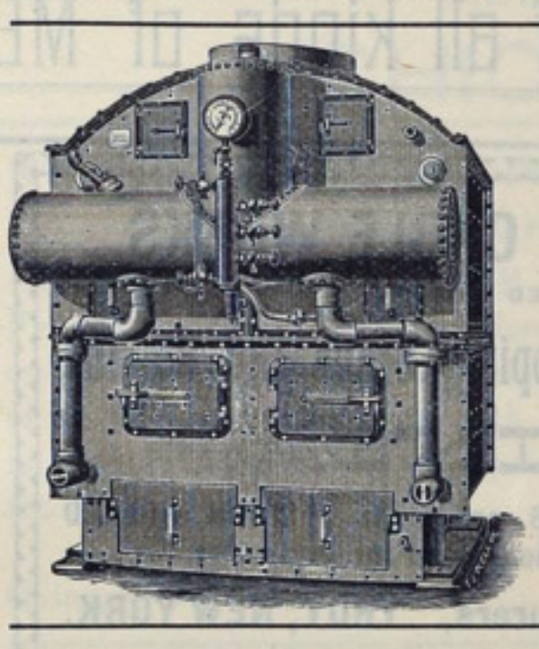

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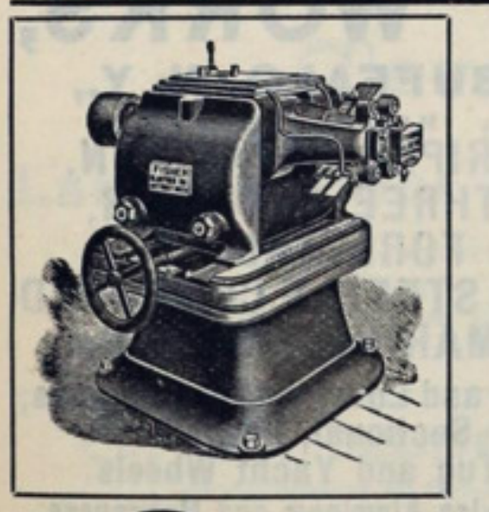

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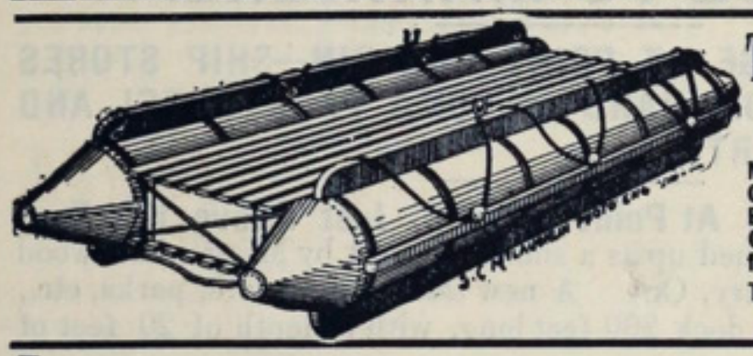

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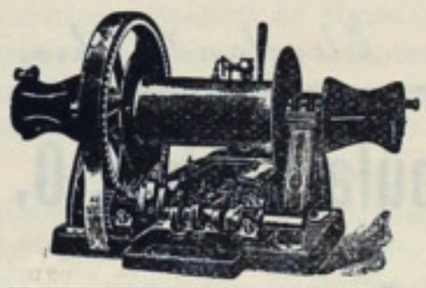

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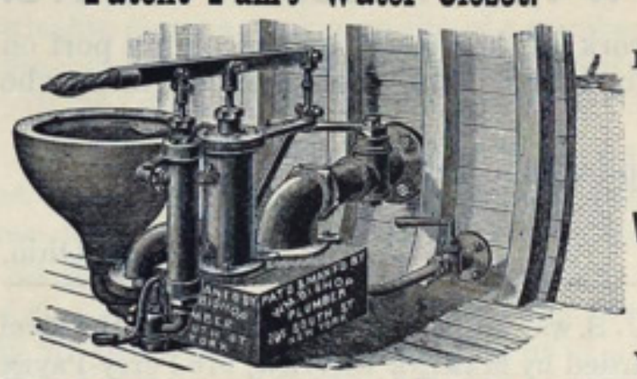

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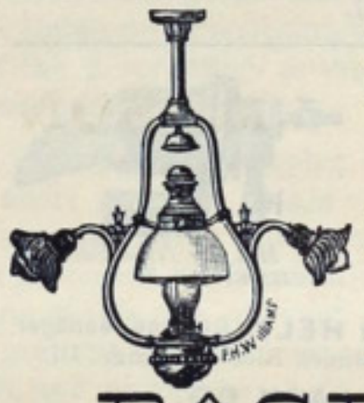

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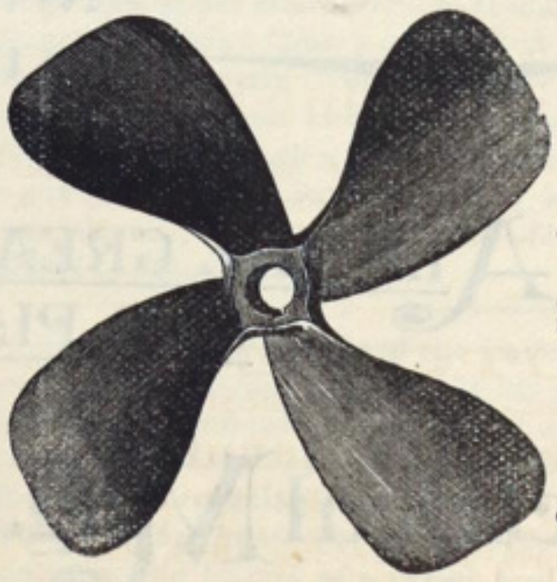

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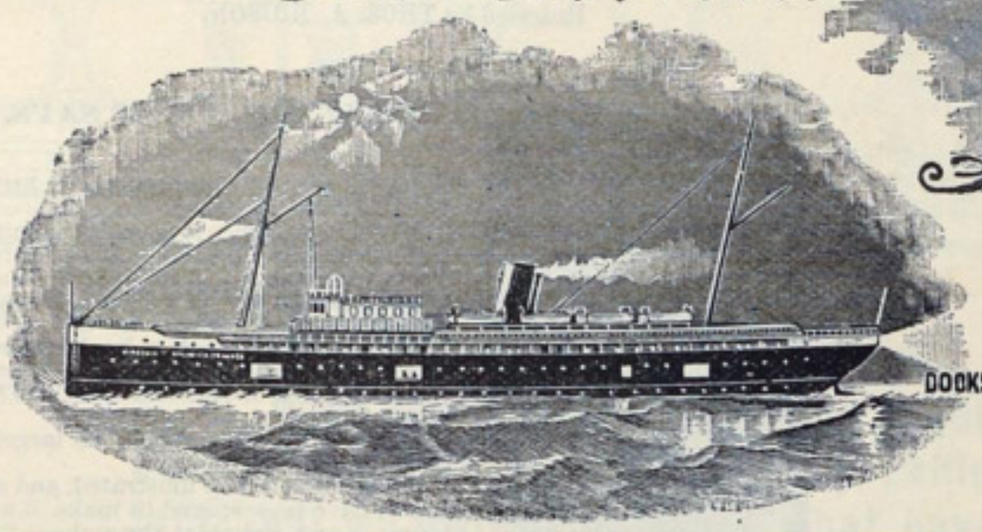

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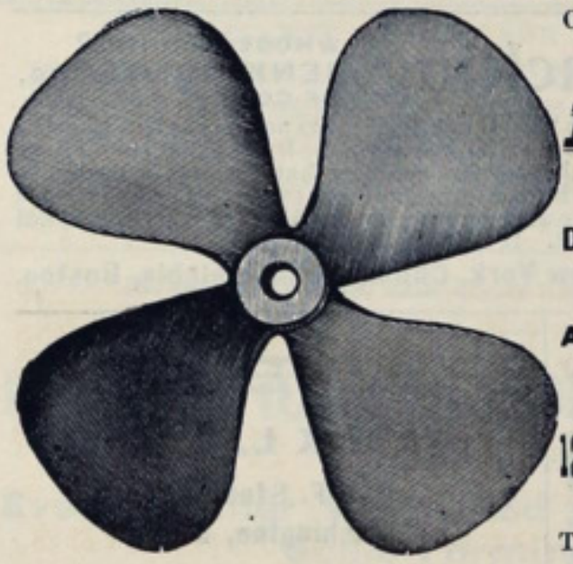

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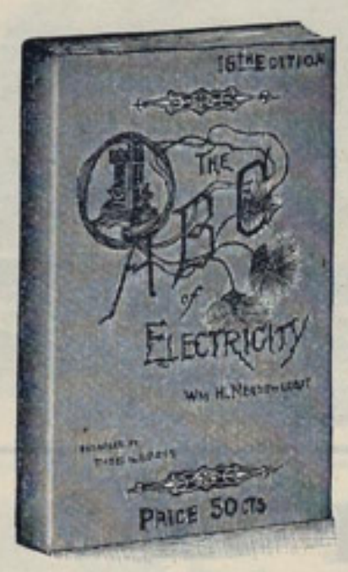

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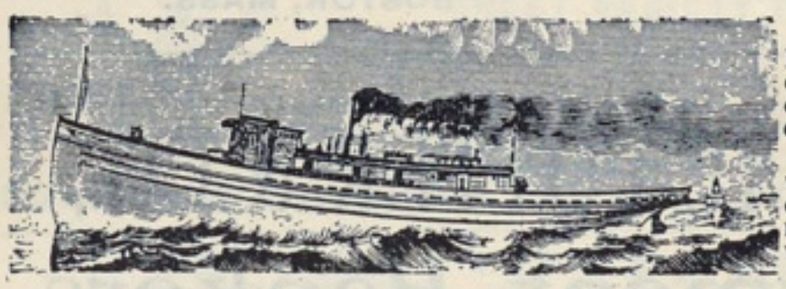

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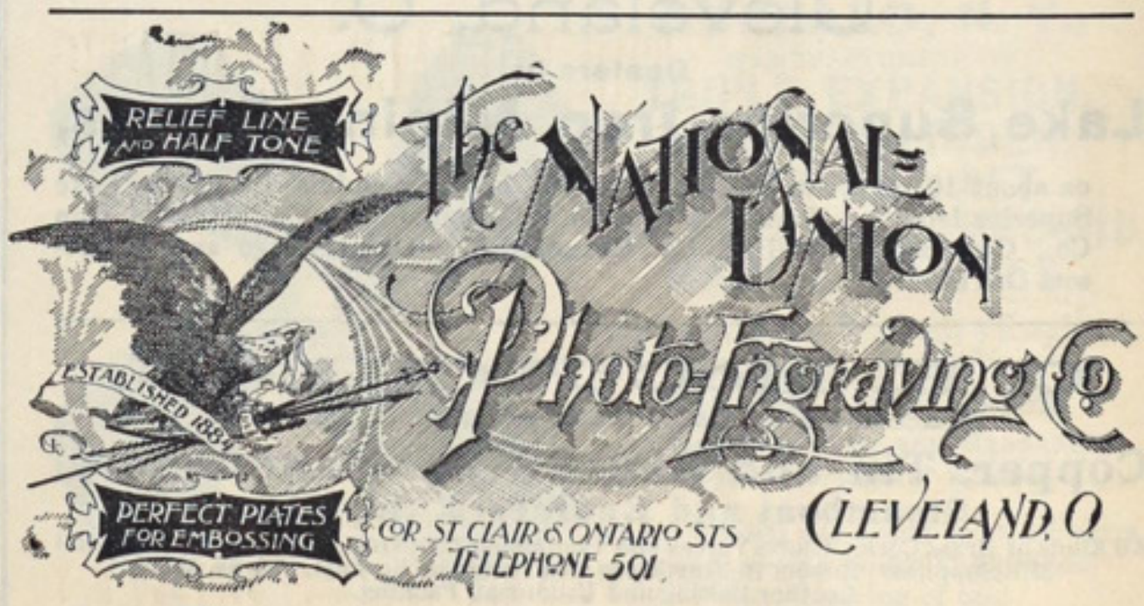

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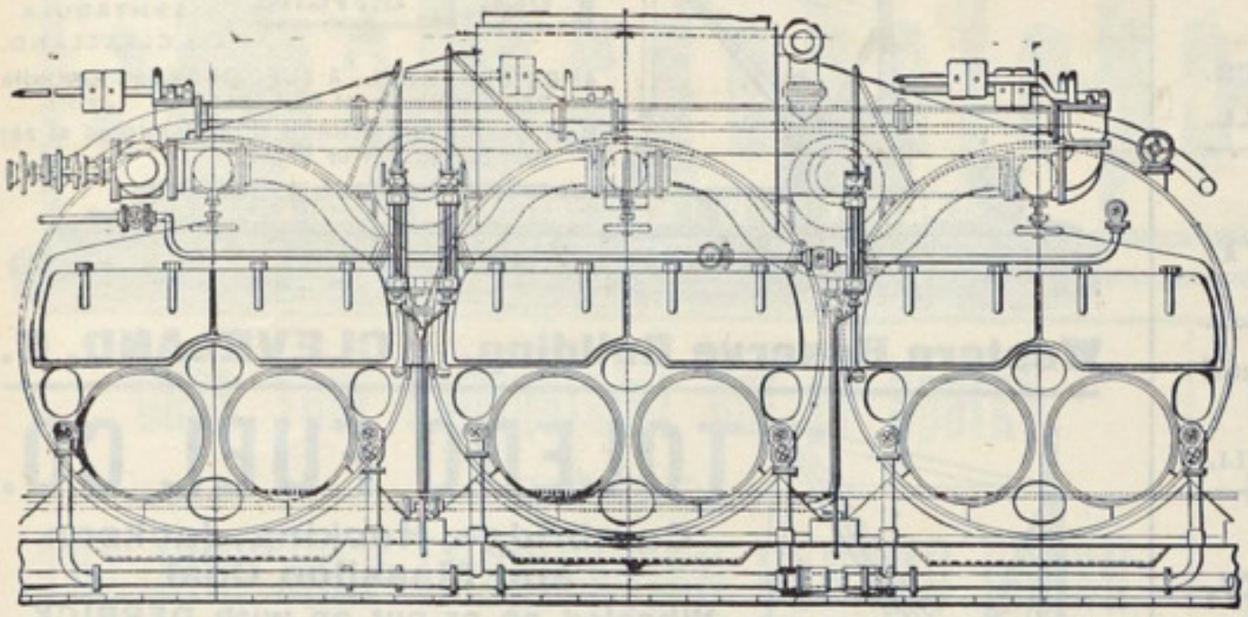

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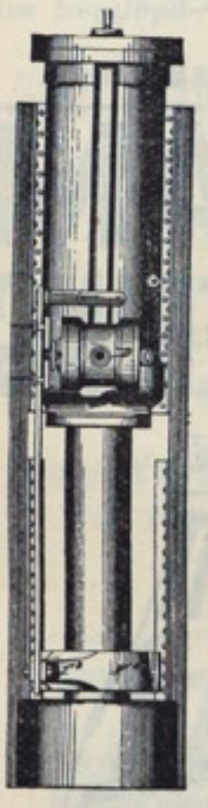

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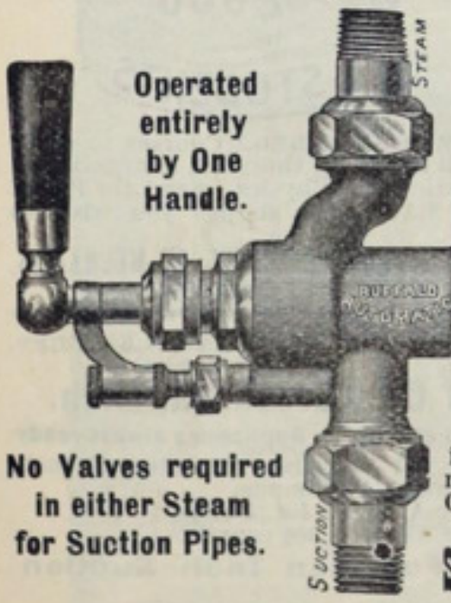

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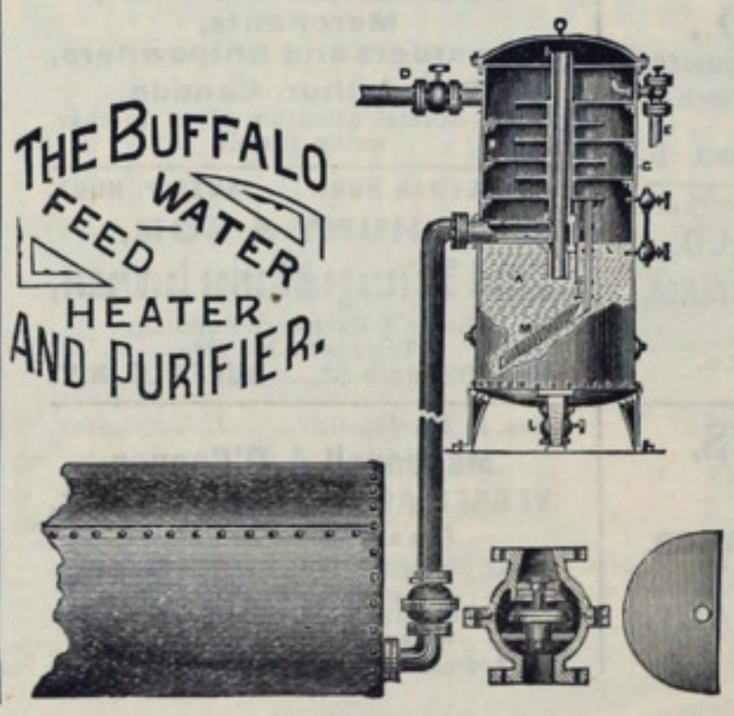

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A.—Settling chamber.
B.—Boiler.
C.—Feed pipe to boiler.
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
G.—Spray disks.
H.—Spray chamber.
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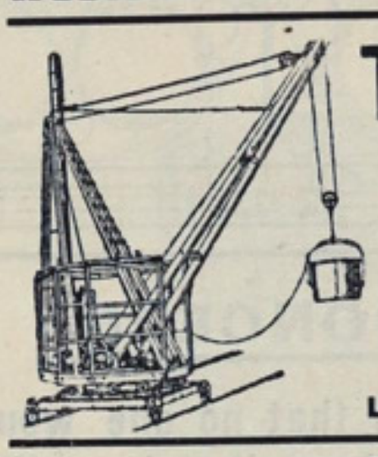
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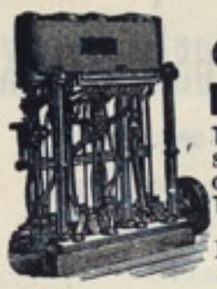
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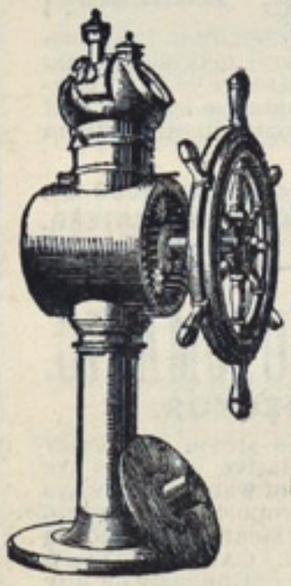
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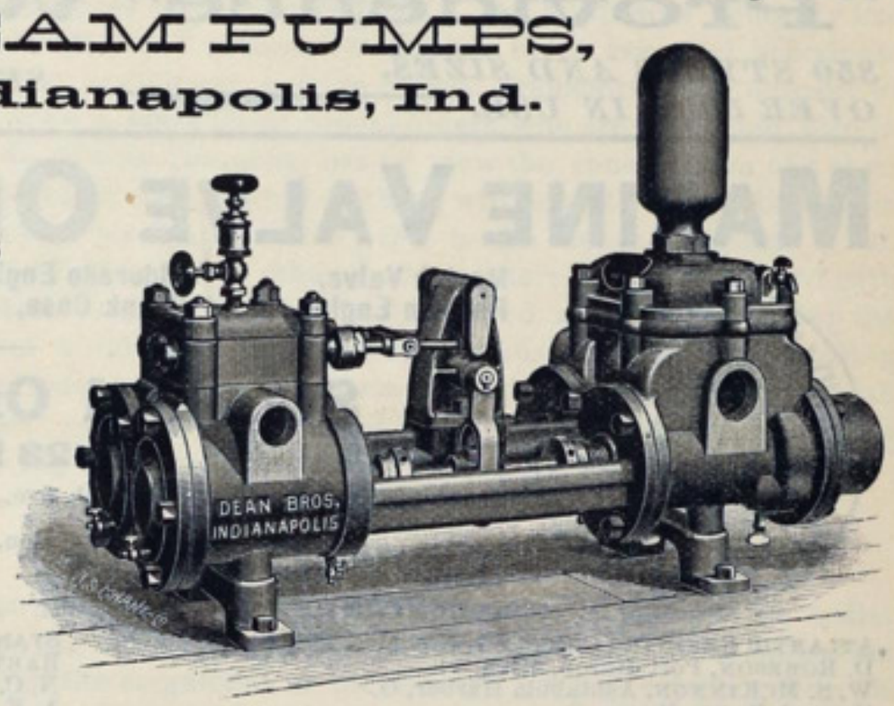

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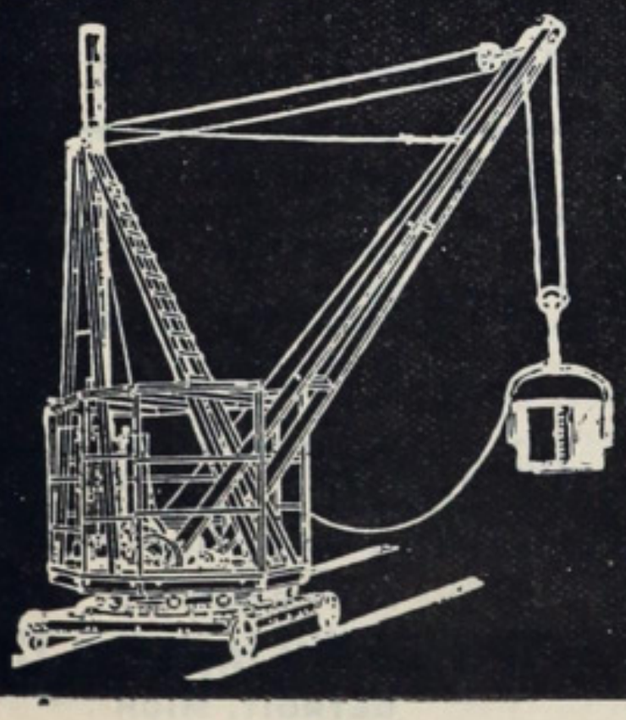

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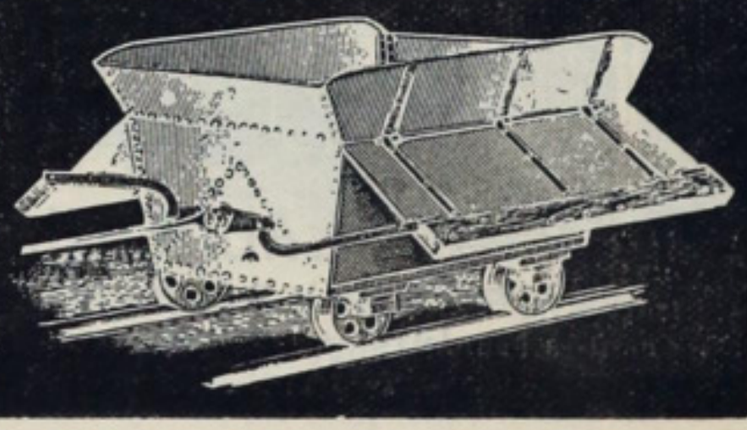

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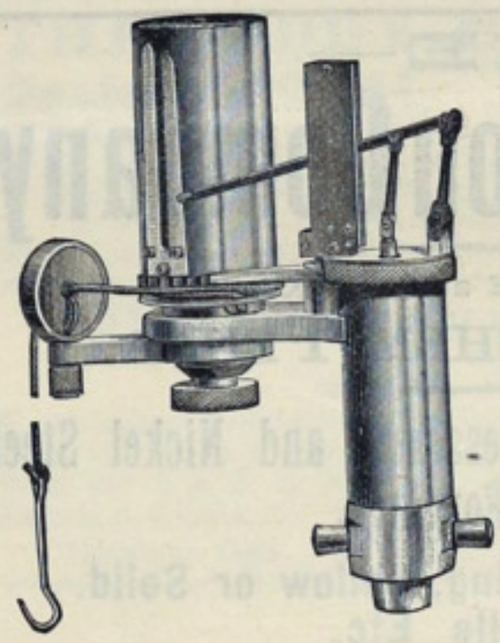

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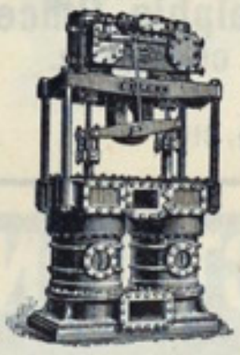

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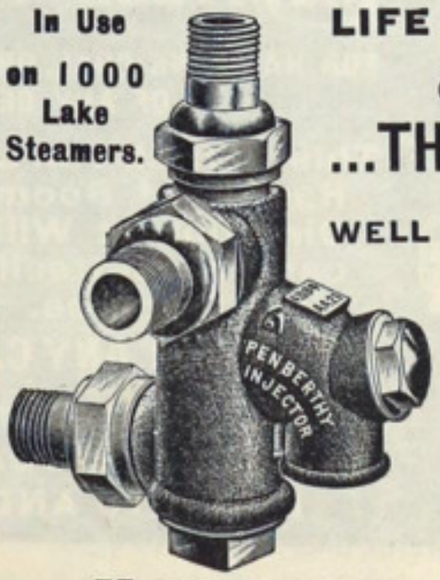

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